

Forensic Evidence



Handbook

CONTENTS

Introduction	5
Section I: Laboratory Submittal Forms	7
Laboratory Analysis Request	8
Latent Evidence Submission Envelope.....	8
Offender DNA Submission	8
Section II: Laboratory Exam Options	9
DNA Casework	10
Drug Chemistry	10
Firearms/Toolmarks.....	10
Latent Prints	10
Toxicology	11
Trace Evidence.....	11
CODIS Section.....	11
Section III: Collection & Preservation	12
Packaging Evidence Properly	13
Collection & Preservation Of Evidence	14
DNA Casework	14
Blood	15
Semen.....	16
Other DNA Sources.....	16
Comparison Standards	17
Collecting Buccal (Oral) Swabs	17
DNA Casework Practices	18
COMbined DNA Index System (CODIS).....	18
Drug Chemistry	19
General Evidence Packaging Guidelines	19
Plant Material	20
General Drug Items: Powder, Tablet, Capsule, Liquid, etc.	21
Clandestine Lab Samples	21
Syringes, Sharps, Glass.....	22
Comparison Standards: Tampering Cases.....	23
Firearms/Toolmarks	23
Handguns & Shoulder Arms.....	23
Serial Number Restoration	24
Expended Bullets, Cartridge Cases, & Shotshells	24
Distance Determination.....	24
Sound Suppressors.....	24
Footwear & Tire Impressions	25

Photographing Impressions	25
Lifting Residue Impressions	25
Casting Impressions.....	25
Toolmark Evidence	26
Latent Prints	26
Exemplar (Known) Prints	27
Photographing Latent Prints	27
Porous Surfaces	27
Nonporous Surfaces.....	27
Soft Surfaces	28
Wet Surfaces	28
Dust	28
Packaging Latent Print Evidence	29
Postmortem Identification Submission.....	29
Identification	29
Toxicology	30
Blood Alcohol Determinations.....	30
Toluene / Solvent Abuse / Glue Sniffing.....	31
Drug Testing.....	31
Suspected Poisoning.....	32
Trace Evidence	32
Ignitable Liquids	32
Explosives.....	32
Fiber.....	33
Filaments	33
Glass	33
Gunshot Residue	34
Hair.....	34
Paint	35
Soil	35
Tape	35
CODIS Section	36
Section IV: Glossary	37

Introduction

The Crime Laboratory Division of the Missouri State Highway Patrol is pleased to provide the latest edition of the Forensic Evidence Handbook to all law enforcement agencies. The Crime Laboratory offers forensic services to all law enforcement agencies from strategically located laboratories throughout the state.

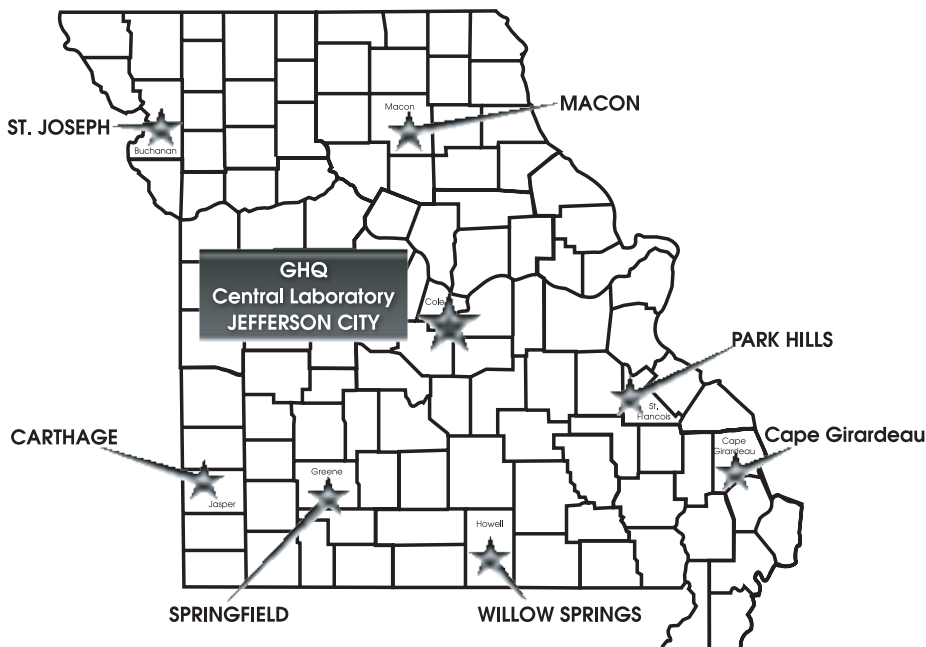
The Missouri State Highway Patrol Crime Laboratory provides testing in the areas of:

- **DNA Casework** — blood, semen, other body fluids, body tissue, DNA analysis
- **Drug Chemistry** — street drugs, pharmaceuticals, and clandestine laboratories' precursors and products
- **Firearms/Toolmarks** — firearm examinations, firearm and tool-mark identification, serial number restoration, distance determination, sound suppressor testing, and impression identification
- **Latent Prints** — evidence processing for latent prints, comparison of developed latent prints, postmortem identification, and Automated Fingerprint Identification System (AFIS) verification
- **Toxicology** — alcohol and drug testing of blood, urine, and other body fluids as well as alcoholic beverages
- **Trace Evidence** — fracture match, gunshot residue, explosives, ignitable liquids, hair, fiber, paint, glass, soil, filaments, and foreign substance identification
- **CODIS Section** — sample collection from qualified offenders and management of Combined DNA Index System (CODIS) database.

The Crime Laboratory in Jefferson City provides testing in all the above analytical areas. The Crime Laboratory in Springfield provides testing in all the above areas excluding CODIS. The Crime Laboratory in Cape Girardeau provides testing in DNA Casework, Drug Chemistry, Latent Prints, and Toxicology. The Crime Laboratory in Carthage provides testing in Drug Chemistry and Latent Prints. The Crime Laboratories in Macon, Park Hills, Willow Springs, and St. Joseph provide testing in Drug Chemistry. The location in Lee's Summit only receives and returns evidence and does not perform laboratory examinations.

In the event the laboratory closest to your location does not provide the type of testing required, that laboratory will transfer your evidence to another laboratory.

We hope this handbook proves valuable to you in your investigations. It covers the types of examinations that are performed by our laboratory system, as well as evidence collection and preservation techniques. We realize some questions will arise. When these questions present themselves, don't hesitate to contact one of our laboratories.



Laboratories

Troop A

504 S.E. Blue Parkway
Lee's Summit, MO 64063
(816) 622-0707 ext. 3177

Troop B

308 Pine Crest Drive
Macon, MO 63552
(660) 385-2132

Troop C

5268 Flat River Road
Park Hills, MO 63601
(573) 431-0166

Troop D

425 E. Phelps Street
Springfield, MO 65806
(417) 868-9400

Troop D

5190 S. Grand Avenue
Carthage, MO 64836
(417) 359-1560

Troop E

122 S. Ellis Street
Cape Girardeau, MO 63703
(573) 290-5130

Troop G

1226 W. Business Highway 60/63
Willow Springs, MO 65793
(417) 469-2433

Troop H

3525 N. Belt Highway
St. Joseph, MO 64506
(816) 387-2345

General Headquarters

1510 E. Elm Street
Jefferson City, MO 65101
(573) 526-6134



Section I

Laboratory Submittal Forms

Laboratory Analysis Request Forms

A Laboratory Analysis Request (LAR) should be filled out for each case submitted. Include on this form each item of evidence submitted for analysis and choose the specific type(s) of analysis or examination desired from the list provided. Register for access to the “Web LAR” with your agency ORI as directed via the Crime Laboratory Division page of the Patrol’s website. The laboratory director strongly encourages all non-Patrol agencies to utilize the Web LAR as the information provided is downloaded directly into the laboratory’s information system. This significantly decreases the amount of time property officers must spend at the laboratory submitting evidence.

The “Summary of Incident” field should be clear and specific to provide a detailed scenario of the event. The “Item Description” field should be an accurate description of the evidence and should not introduce bias/assumption. For example, do NOT describe drug evidence items as “cocaine” or “crack.” Rather, use the appropriate descriptions of “powder residue,” “plant residue,” “plant material,” or “blue tablet labeled M120.” Thorough documentation must be submitted to the laboratory for items undergoing DNA examination. The recovery location of the evidence, how the evidence relates to the crime, and how it is reasonable that the evidence belongs to the putative perpetrator are essential to determine if the sample is eligible for CODIS entry.

Latent Evidence Submission Envelope

These manila envelopes are designed to provide assistance with the submission of latent print evidence. You may make use of these latent evidence envelopes for both processing and comparison evidence. It is recommended they be used for the submission of latent prints and/or exemplars.

If you need additional envelopes, contact any of the Patrol’s Crime Laboratory Division locations throughout the state.

Offender DNA Submission Form

A Missouri Offender DNA submission form (SHP-6) must be completed in its entirety and submitted in the sealed envelope with the offender DNA sample. The forms are available in a tablet form at any crime laboratory or as a fillable PDF on our website. The SID message generated at the time of booking on a LiveScan device contains a link to a prefilled submission form. Arresting agencies desiring more information on this time-saving method can contact the Crime Laboratory’s CODIS Section. (Also, refer to the link on the website for videos at <http://www.msdp.dps.missouri.gov/MSHPWeb/PatrolDivisions/CLD/DNAProfiling/DNAProfiling.html>).



Section II

Laboratory Services

Laboratory Exam Options

DNA Casework:

- Blood Detection — Examine items of evidence for the presence of blood.
- Semen Detection — Examine items of evidence for the presence of semen.
- DNA Analysis — items of evidence that have blood and semen detection where DNA analysis is also required, buccal swabs, swabs from items at crime scenes, or clothing that needs to be tested for DNA, but blood or semen detection does not apply

Drug Chemistry:

- Marijuana Analysis — plant material that is suspected of being or containing marijuana
- Drug Analysis — items of evidence suspected of being or containing controlled substances other than marijuana

Firearm/Toolmark:

- Firearm/Ammunition Examination — perform firearm examinations and comparisons of ammunition components
- Toolmark Examination — perform comparison of tools to toolmarks
- Serial Number Restoration — items with defaced serial numbers that are to be restored
- Impression (tire/footwear examination) — examination of tire/footwear impressions
- Shooting Distance — examine items such as clothing that need to be analyzed for muzzle-to-target distance determination. This exam involves clothing with a suspect bullet hole.

Latent Prints:

- Fingerprint (processing) — evidentiary items to be processed to develop latent prints. Latent comparisons and/or AFIS entry are assumed if latent prints of value are developed.
- Fingerprint (latent comparison) — Perform comparisons of latent prints developed at the scene with known exemplars. AFIS entry is assumed if manual comparisons of latent prints of value with known exemplars yield negative results or if there are no known subjects listed.
- AFIS Entry — latent prints to be searched through the AFIS database only (no comparisons)
- Postmortem Identification — comparisons and/or AFIS entry of post-mortem prints for identification purposes

Toxicology:

- Blood Alcohol Analysis — Analyze blood samples for alcohol
- Urine Drug Analysis — Analyze urine samples for drugs
- Blood Drug Analysis — Analyze blood samples for drugs
- Alcoholic Beverage Analysis — Determine alcohol content in liquid samples

Trace Evidence:

- Explosives analysis — Examine pre-blast and post-blast items or suspected explosives.
- Filament (on/off in accident) — Examine lamps from automobiles and boats to determine if on or off at time of accident.
- Flammable (fire investigation) — identification of flammable liquids for the presence of flammable liquid residues on fire debris
- Fracture Match (broken/torn) — examination of broken or torn items to determine if originally one piece
- Gunshot Residue Kit Analysis — analyze GSR kits taken from hands or other surfaces. Kits taken from shooting victims typically will not be analyzed
- Gunshot Residue (except kits) — analysis of items such as clothing that need to be sampled for the presence of gunshot residue (Clothing is typically limited to gloves, long sleeve shirts and jackets.)
- Hair/Fiber (trace exams only) — the detection, collection, or comparison of hairs, fiber standards, and fibers from shoes, clothes, or other sources (DNA exams will be performed on hair if possible or necessary.)
- Hair (with DNA) — items that contain hair or are to be examined for the presence of hair that have been submitted with other items needing DNA exams
- Paint Analysis — the comparison of paint standards and transfers
- Physical Characteristics Comparison — comparison of items such as tape, wood, plastics, and other miscellaneous materials
- Soil (processing/examination) — the detection, collection, or comparison of soil standards and questioned soil samples from shoes, clothes, or other sources
- Substance ID (unknown/tampering) — substances suspected of being harmful or causing property damage that may be found in food, mail, or on damaged property

CODIS Section:

- Processing of qualified offender samples per Section 650.055 RSMo.



Section III

Collection & Preservation Of Evidence

Packaging Evidence Properly

1. ALWAYS utilize a laboratory analysis request (LAR) form. The Patrol Crime Laboratory Division director strongly recommends that non-Patrol agencies register for and use the Web LAR for submittal of evidence to the crime laboratories. (See Section II, p. 10).
2. Always label evidence containers with a description of the contents.
3. Latent print comparison evidence (tenprint cards, palmprint cards, and/or latent print lifts) should be packaged in manila envelopes SEPARATELY from items requiring processing examinations. All items needing comparison examinations may be packaged together in one envelope.
4. ALWAYS package firearms separately from other evidence. (Firearms are checked immediately to make certain they are unloaded.) If available, please use cardboard boxes specifically designed for firearms evidence. Secure loose cartridges (live ammunition) to prevent them from being lost or lodging in the action or chamber of a firearm. Loose cartridges should be placed in a secondary container (e.g. sealed plastic bag, envelope, etc.) within the primary container. Cartridges in a firearm's magazine can remain in the magazine and be submitted as such.
5. ALWAYS package urine SEPARATELY from blood. Leave expansion room in urine container; urine should be stored in a freezer.
6. ALWAYS package tubes of blood SEPARATELY from clothing. Whole blood should be stored in a refrigerator.
7. Sexual assault kits should NEVER be packaged with clothing. Toxicology evidence from sexual assault investigations must be packaged and submitted separately.
8. Whole blood should ALWAYS be packaged SEPARATELY from drug-related items.
9. AVOID packaging items for latent prints processing with items for DNA, trace, firearms identification, etc. unless both exams are requested on item. It may be advantageous to remove/repackage drug evidence from any original containers needing latent print examination.
10. DO NOT submit any amount of anhydrous ammonia, hydrogen chloride gas, sodium metal, or any gas in a compressed gas cylinder.
11. DO NOT submit open liquid containers to the laboratory. ALL containers should be capped and sealed.
12. Evidence stained with body fluids (blood, semen, etc.) MUST BE AIR DRIED COMPLETELY prior to packaging in paper and submission to the laboratory.

13. DO NOT submit syringes with uncapped needles. DO NOT submit syringes for drug analysis which do not contain visible liquid or residue. Syringes should be packaged separately and be submitted in a hard-sided container, such as a sealable plastic tube.
14. DO NOT submit wet or moist marijuana in plastic bags to the lab. AIR DRY before submitting.
15. DO NOT submit syringes, drug paraphernalia, or miscellaneous items that do not need to be analyzed.
16. Sharps, such as knives and glass, must be submitted in a hard-sided container. The container should protect those handling the evidence and prevent the breakage of fragile evidence. DO NOT package sharps in a paper or plastic bag.
17. Suspected marijuana plants should be dried, the leaves removed from the stalks, and only leaves submitted.
18. Drink containers being submitted for DNA analysis (ex. cans or bottles) should be emptied prior to packaging.
19. NONEVIDENCE Offender DNA samples must be submitted in the prelabeled and postage-paid envelope provided in the kit. DO NOT use Offender DNA collection kits for EVIDENTIARY samples in a case.

Collection & Preservation Of Evidence

It is important that each item submitted as evidence be sealed with TAMPER EVIDENT EVIDENCE TAPE, dated, initialed, and labeled as to its contents and its association with the victim or suspect. Evidence stained with body fluids (blood, semen, etc.) MUST BE AIR DRIED COMPLETELY prior to packaging and submission to laboratory.

Separately package and seal all items in breathable, nonplastic (e.g. paper), loose-fitting containers. Packages should not be bound tightly; the criminalists must return items to these containers and seal them following examinations. Items to be examined by more than one section should be packaged and stored by prioritization of exams.

1. DNA Casework

Body fluid stains are valuable evidence which can be used to associate a suspect with the crime or eliminate him from consideration. How biological evidence is collected will affect how it can be analyzed today or 20 years from now in a post-conviction case.

One of the underlying principles behind forensic analysis is the concept that when two individuals come into contact with one another, or if an individual comes into contact with an object there is a high probability of transfer of biological material (skin, hair, etc.). The transfer does not always have to be as obvious as blood. If contact or transfer occurs between two individuals, it is likely that both individuals' DNA profiles may be present. When DNA profiles are developed from evidence, it is imperative that comparison standards from ALL individuals known to be associated with the crime scene be analyzed to interpret test results effectively. This allows elimination of those individuals that are not consistent with the DNA profiles. It also avoids wrongful implication of an innocent person if two individuals happen to have a profile in common. In addition to standards from victims and suspects, it may be necessary to obtain standards from anyone known to be involved with the crime or crime scene, such as spouses, significant others, housekeepers, caregivers, etc.

■ Blood

When materials stained with blood are to be sent to the laboratory:

Air dry the stained evidence on a piece of clean paper placed in a ventilated area. Place the dried item in a paper container (bag, envelope, or box), identify the contents, seal, initial, and date. Any debris that falls from the item onto the paper during the drying process should be placed in a smaller container, sealed, initialed, dated, and placed into the container with the evidence. **DO NOT PACKAGE ITEMS WHILE THEY ARE STILL MOIST. ALLOW THEM TO DRY THOROUGHLY.** All DNA evidence should be placed in paper packaging; nothing airtight, such as plastic or glass. Package items from the victim(s) and suspect(s) into separate containers. Collect a comparison standard from each individual involved in the incident. Dry specimens completely for transport to the laboratory.

When materials stained with blood cannot be sent to the laboratory:

- Porous material (cloth, leather, etc.) — Cut the area believed to be stained.
- Nonporous material (glass, metal, etc.) — Remove stain with a cotton swab that has been moistened slightly with water. The sample should be well concentrated on the tip of the swab. Air dry the sample completely prior to packaging in paper.
- Liquid stains may be collected by soaking the sample onto clean cotton swabs. The sample should be well concentrated. Air dry the sample completely prior to packaging in paper.

Label all containers with a description of the contents and exhibit number then seal, initial, and date. Collect a comparison standard from each individual associated with the incident. Dried specimens may be stored at room temperature in a paper container.

■ Semen

Air dry the stained material on a piece of clean paper placed in a ventilated area. Condoms should be frozen soon after collection if drying is not possible. Stained area on large items or items that cannot be sent to the laboratory (e.g. mattress, couch) may be cut out and submitted. Stains on nonporous material may be removed with a cotton swab, which has been moistened slightly with water. Place the dried material in a paper bag, label the bag with an exhibit number, and seal, initial, and date. **DO NOT PACKAGE ITEMS WHEN THEY ARE STILL MOIST. ALLOW THEM TO DRY THOROUGHLY.** Obtain samples from the victim using the Missouri State Sexual Assault Evidence Collection Kit. Label the completed kits with exhibit number, initials, and date, and apply proper seal. Also, obtain comparison standards (blood or buccal swabs) from any suspects or other individuals involved in the case. Hair standards for trace evidence analysis should be collected, also. **DO NOT** package blood tubes or urine specimens in a Sexual Assault Evidence Collection Kit (SA Kit). If hospital staff packages these items in a kit, please remove them and package them separately. The blood tube, urine specimen, and the Sexual Assault Evidence Collection Kit all have different storage requirements.

NOTE: Missouri State Sexual Assault Kits can be obtained from any crime laboratory in the state.

■ Other DNA Sources

Items that contain saliva (e.g. bottles, cans, cigarette butts) are good sources of DNA. Refer to the blood section for proper collection of saliva from porous, nonporous, or liquid stains, or submit the entire item for analysis. DNA may be obtained from items that do not contain blood, semen, or saliva. This type of DNA is often referred to as touch or wearer DNA. Extreme caution should be taken when handling these items as contamination occurs easily. Touch DNA should not replace latent print examinations. Items submitted for touch DNA analysis should be items that were extensively handled by the suspect (e.g. tools the suspect brought to the scene) or clothing worn that extensively touched the surface of the skin. Touch DNA evidence must be foreign to the crime scene and should not belong to the victim.

■ Comparison Standards

For a complete DNA analysis, comparison standards from all individuals known to be associated with the crime or crime scene are needed. There is a general misconception regarding the use of comparison standards in DNA analysis. Currently, a DNA profile is NOT a fingerprint or unique identification. Although a person's DNA is unique only to them, the DNA molecule also has many common genes between individuals, such as genes for arms, legs, hair, eyes, etc. The current technology only allows the laboratory to analyze a small number of genetic markers that may differ between one person and another. In the future, this number may increase to the point that the exact origin of a stain can be determined without reasonable doubt. Until that time, there will be population frequency estimates included in MSHP DNA laboratory reports. A frequency of 1 in 1,000,000, for example, estimates that a given DNA profile will be found once in every one million individuals, twice in every two million individuals, or 100 times in every 100 million individuals. This statistic indicates that in the state of Missouri alone five people may share the same DNA profile. Therefore, it is not impossible that a victim and suspect of a crime have the same or similar profiles.

When obtaining comparison standards, the buccal swab method is preferred.

- Buccal (oral) Swabs: See specific collection instructions below. **DO NOT USE THE MSHP OFFENDER DNA SAMPLE COLLECTION CARD/KIT.** This kit is not to be used for casework suspect standards. Use your agency's own swabs and packaging with proper chain of custody.
- Blood standards: Should be collected in purple-capped (EDTA) vacutainer tubes. (If toxicology exams are also desired, collect an additional blood sample in a "gray" stoppered blood tube as outlined in Section 5, Toxicology.)

■ Collecting Buccal (Oral) Swabs:

The buccal swab is designed to recover epithelial (skin) tissue from the interior of the cheek. Have the individual vigorously (without causing injury) rub the swab along the interior cheek for approximately 30 seconds to one minute. The swab must be rubbed vigorously to increase the chance of recovering an adequate amount of cheek cells. The swab should be allowed to air dry, then placed into an envelope, sealed, initialed, and submitted to the laboratory in a timely manner. Submit at least two swabs from each individual (two to four preferred). Please label the package with the name of the individual from whom the sample was taken. (i.e. Collected from John Doe.)

■ DNA Casework Practices:

To provide the best service to our submitting agencies, it is essential the laboratory knows how each piece of evidence is associated with the individuals involved in the case. These associations should be detailed on the Web LAR or your laboratory analysis request. (See Section II. p. 10) With this information, the laboratory can concentrate on the most productive evidence, properly interpret the results obtained, and provide a more comprehensive and informative report.

■ Combined DNA Index System (CODIS):

The COMBINED DNA INDEX SYSTEM database is used to support law enforcement by providing investigative leads to cases. The database relies upon properly collected reference standards.

The MSHP DNA casework sections are responsible for processing crime scene cases that agencies submit to the laboratory. Types of cases range from missing persons and burglaries to sexual assaults and homicides. The analysts' primary duties are stain identification and DNA typing of evidence from crime scenes, with subsequent comparison to known reference standards. Profiles generated from evidence may be entered into the CODIS for periodic searches against the database if they meet the eligibility criteria for entry. To meet CODIS eligibility criteria, documentation from the submitting agency must state that a crime was committed and that the evidence collected is from the crime scene. Additionally, documentation must be provided that clearly demonstrates that it is reasonable to assume that the profile from the crime scene item can ONLY belong to the person who committed the crime (not the victim or any other individual associated with that crime scene). Items that are seized from the suspect's person or property are not eligible for CODIS and must have a DNA reference standard submitted prior to DNA examinations being conducted.

The DNA Casework Section does not have access to offender profiles. Eligible profiles from cases are searched at the state and national level against each other as well as against the offenders, with the goal of possibly linking cases to each other and/or to an offender in Missouri or nationwide. When a match (hit) is made on a case, the submitting agency is notified. The DNA Casework Section analyst will request the submitting agency obtain a known reference standard—typically a mouth (buccal) swab—for comparison to the case. When the reference standard comparisons are complete, a supplemental report is issued.

Reference standards from known suspects should be submitted if possible with the other evidentiary items in the case. (Searching CODIS should not be used routinely in place of obtaining a reference standard, particularly if the suspect is known.) When collecting standards for case-

work comparison, the standards should be collected under consent or warrant. Missouri Offender DNA Collection Kits are not intended to be used to obtain a DNA sample for casework.

For more information on the CODIS Section of the laboratory, refer to “CODIS Section,” found later in this booklet.

2. Drug Chemistry

When handling and packaging drug evidence it is important to prevent contamination between the specimens and from outside sources. Chemical samples (like those from clandestine laboratories), sharps, and syringes must be safety handled due to the additional hazards they pose. These hazardous items have additional packaging requirements to protect the integrity of the evidence and ensure the safety of those handling the evidence.

The Drug Chemistry Section strives to provide quality analysis in a timely fashion. Limiting the amount of evidence submitted is crucial in maintaining efficiency, and results in a decreased turnaround time for submitting agencies.

General guidelines to consider when submitting drug evidence:

- SUBMIT only the most probative items.
- AVOID submitting extraneous paraphernalia, especially in instances where there is a weighable amount of powder, plant material, etc. Generally, only one paraphernalia item per suspect will be tested.
- DO NOT submit items that do not have a visible residue. They will not be examined.
- CONSIDER submitting representative samples of a bulk quantity of material.
- DO NOT submit field test kits as they contain chemicals, some hazardous, and should be treated as such.
- DO clearly mark probable cause items.
- ALWAYS properly label and package biohazard items. This includes bloody items and items recovered from body cavities.
- ALWAYS clean items that have been recovered from body cavities.

General Evidence Packaging Guidelines

- Packaging is in place to protect and preserve the evidence. This can be achieved through any number and type of inner packages

and cushioning material that are necessary to prevent damage, contamination, and change of the drug evidence.

- Be mindful that the outer container submitted to the laboratory needs to be appropriately sized and exhibit a proper seal with initials and a date.
- Do not overstuff containers, so that it becomes difficult to place all items back into the container after analysis. The criminalist must open the container, remove the evidence, and place it back into the same container.
- Do not completely cover the container with evidence tape.

■ Plant Material

It is always important to ensure that plant material is completely dry before packaging and submitting it to the laboratory. Failure to thoroughly dry plant material before packaging may result in the growth of mold. This makes proper analysis difficult, and could potentially change the condition of the plant material so severely it becomes unsuitable for analysis. Additionally, inhalation of mold spores can result in respiratory problems. COMPLETELY dried plant material evidence can be placed in a box, paper bag, container, and even a plastic bag before being secured with evidence tape.

For large plant material seizures, the evidence should be well documented before submission to the laboratory. This includes taking photographs, obtaining an accurate count of the number of plants, and recording a gross weight and any other information that your agency may need. Representative samples may be obtained to avoid large, bulk submission to the laboratory. Consider using Missouri statutory weights as a guideline to submit only the plant material necessary to meet a charge level. Please call the laboratory with any questions about bulk sample submission or representative sampling.

Additional guidelines for plant material submission:

- Plants seized from grow operations should be counted, dried, have their leaves stripped, and only the leafy material submitted to the laboratory.
- DO NOT submit dirt, growing media, fertilizers, or plant containers.
- DO NOT submit mature stalks.

■ General Drug Items: Powder, Tablet, Capsule, Liquid, etc.

Handling of drug evidence shall be kept to a minimum and only performed with proper personal protection equipment to prevent exposure to potentially harmful and deadly substances. The majority of drug evidence is composed of solids (powders, crystalline, tablets). It is appropriate to submit these items in the packaging in which they were seized, if the integrity of that packaging is intact. Otherwise, appropriately sized plastic, Ziploc®-style bags can be used to isolate specimens and prevent contamination. That inner packaging may be sealed at the agency's discretion. Remember to use size appropriate packaging, as a single tablet or small plastic bag corner can get lost in an oversize container. If necessary, additional internal packaging can be added to secure the item.

Generally, any marked tablet or capsule that does not contain a substance scheduled by the state of Missouri will not be tested. Additionally, only one tablet per schedule will be tested.

Liquids that are not related to a clandestine laboratory investigation should be packaged in a manner that prevents leakage and evaporation. Clandestine laboratory approved containers can be used to submit these items and ensure that spillage does not occur.

Any item of glass, be it evidence or a layer of packaging, shall be placed in a box or container to prohibit breakage. If breakage does occur, the packaging should be capable of retaining the pieces of glass.

- AVOID submitting obvious noncontrolled, over-the-counter medications. Resources such as the Physician's Desk reference, poison control, and www.drugs.com can assist in preliminary identification of tablets and capsules.
- ALWAYS freeze food items and place beverages in the refrigerator prior to submission. Please advise a laboratory evidence technician when submitting these items, so that they can be stored properly at the laboratory.
- PRIOR to submitting known standards of a medication when tampering is suspected, please contact the laboratory.

■ Clandestine Laboratory Samples

Due to the hazardous nature of chemicals used in the manufacture of illicit drugs, safety precautions need to be taken when handling and packaging this type of evidence. Certain chemicals pose such a hazard that they will not be accepted by the laboratory under any circumstances.

Other chemicals and liquids are accepted only in smaller quantities and in approved containers. An example of an approved container con-

sists of a one ounce glass vial with a Teflon liner and screw cap, stored in a plastic Nalgene bottle. Powders, solids, iodine, and items with residue (filters) that have a strong chemical odor should also be packaged in this manner. Suspected iodine samples should be packaged in a separate, external container.

Preferably, only the amount of liquid/powder needed to prove the offense should be submitted. Larger volumes of liquids can be submitted; however, representative sampling is encouraged. To submit a larger volume of liquid, divide the liquid into multiple approved containers. These should be labeled clearly as originating from the same container and the laboratory analysis request should reflect that the containers can be combined for analysis.

The Drug Chemistry Section does not test for Coleman fuel, sulfuric acid, and various other chemicals related to drug manufacturing. The Drug Chemistry Section can test for ammonia, iodine, lithium, and red phosphorous.

The following items MAY NOT be submitted to the laboratory:

- anhydrous ammonia,
- hydrogen chloride gas,
- sodium metal,
- compressed gas cylinders,
- samples not in approved containers, and
- bulk quantities of any liquid or solid chemical used to manufacture drugs.

■ Syringes, Sharps, Glass

Frequently, drug cases also contain various puncture, scratch, and cut hazards from objects such as syringes, razor blades, and broken glass. These types of hazards need to be packaged in a way that protects all the individuals who handle that specific piece of evidence.

All syringe and sharp hazards should be packaged separately from other evidence. Syringes should be packaged individually in hard plastic tubes, boxes, or syringe safes. Sharps and glass should be packaged in hard-sided containers to protect from puncture and/or breakage. Glass that is already broken should be treated as a sharp hazard and packaged as such.

- **DO NOT** submit syringes or sharps if they are not essential to the case.

- **DO NOT** wrap evidence tape around syringes or sharps.
- **DO NOT** wrap syringes in plastic bags, cloths, etc., before placing in approved sharps containers.
- **DO NOT** submit syringes that do not have visible residue.

■ Comparison Standards: Tampering Cases

If available, in cases where medication tampering is suspected, collect known standards of the same brand, concentration of dosage, and lot number for liquids in syringes, ampoules, and vials. Also, collect known standards of tablets and capsules. Clearly mark these specimens as standards. **DO NOT REMOVE STANDARDS FROM THEIR ORIGINAL CONTAINER.**

DO NOT MIX SAMPLES. PACKAGE EACH SEPARATELY TO AVOID MIXING DURING TRANSPORT.

3. Firearms/Toolmarks

Firearms leave unique markings on expended ammunition components as well as detectable residue on the shooter's hands.

■ Handguns & Shoulder Arms

All firearms should be unloaded, packaged separately, and properly sealed in appropriate container(s) before submission to the laboratory. Do not package firearms in any type of plastic bag or wrapper. Recommended containers for handguns and shoulder arms are sturdy cardboard boxes or cardboard boxes specifically designed to secure firearms. **NEVER PLACE TAPE OF ANY KIND ON FIREARMS OR AMMUNITION.**

Never insert anything into a firearm's barrel, cylinder, or action (e.g. plastic ties, flex cuffs, pens, pencils, etc.). These items can alter a firearm's identifying characteristics and damage its working parts. Notes describing the position(s) of expended cartridge cases, live cartridges, safeties, hammers, etc., should be made if pertinent to an investigation.

If a firearm in a body of water is to be collected, it should remain in the original water. A water tight container such as a lidded plastic dish, capped PVC pipe, etc., should be lowered into the water and allowed to fill. This allows the firearm to be placed in the container without exposing it to the air.

■ Serial Number Restoration

If a firearm's serial number has been defaced or obliterated, its restoration can be attempted. Prior to packaging and submission to the laboratory, make identifying marks such as your initials on the firearm for future identification.

■ Expended Bullets, Cartridge Cases, & Shotshells

All expended ammunition components should be packaged and sealed in appropriate container(s).

Do not scratch, scribe, or mark the sides or bearing surface of a bullet. The base or nose areas of a bullet can be marked for identification purposes.

Do not scratch, scribe, or mark the headstamp or primer areas of a cartridge case or shotshell. A cartridge case can be marked for identification purposes near or in the open mouth area. A shotshell can be marked for identification purposes near the crimp or open mouth area.

■ Distance Determination

Determination of shooting distance from a single projectile firearm discharge is based on gunpowder residue deposited around the bullet entry hole. The outermost garment or contact surface will contain the gunpowder residue. This outermost garment, the firearm, and ammunition must be submitted for the examination to be performed.

Allow all clothing to air dry prior to packaging. Seal the clothing in a breathable container such as a box or paper bag. The best practice to preserve the deposited gunpowder is to not wash the garment up to fit in a bag. The recommended method is to place the garment on a hanger prior to placing it in a box.

Generally, the practical limit of distance determination is about three feet. Beyond three to four feet sporadic gunpowder particles do not form a reproducible pattern and are therefore not suitable for range determination.

If a shotgun was used, the pellet spread pattern is used for distance determination when beyond the gunpowder deposition range.

■ Sound Suppressors

Suppressors, also known as silencers, can be submitted for testing.

■ Footwear & Tire Impressions

Shoes, boots, and tires to be compared to questioned impressions should be submitted to the laboratory. Each item should be securely packaged and properly sealed in an appropriate container(s). A large trash bag works well as a container in which to package a tire. Do not remove any dirt, mud, debris, etc., which has adhered to the footwear or tires.

■ Photographing Impressions

Impressions should be properly photographed with a ruled scale before lifting or casting. An impression should be photographed from directly above using a detachable flash or light source (the use of a tripod is recommended). Each impression should be flashed from three or four different directions with the light source held low and to the side. A digital camera with a megapixel of at least eight should be used. Set the camera to capture the photograph in a RAW picture format, instead of JPG, which will give the best quality photograph.

■ Lifting Residue Impressions

Adhesive lifters, gelatin lifters, and electrostatic lifting techniques may be utilized to recover and preserve residue impressions. These are impressions made from residue (blood, dirt, etc.) which have adhered to the outsole of a shoe or tire tread and then were deposited onto a hard surface. Residue impressions are fragile in nature and can be easily or unintentionally destroyed. Therefore, the surface should be submitted to the laboratory. If this is not possible, sufficient care should be exercised when attempting to lift an impression from a surface. Impression lifts should be packaged separately and submitted to the laboratory in properly sealed containers.

■ Casting Impressions

Dental stone or die stone casting material is recommended for the casting of three dimensional impressions (impressions in dirt, mud, snow, etc.). Casting techniques should be practiced prior to attempting to cast impressions at a crime scene. The use of plaster of Paris for casting impressions is discouraged.

Ziploc® bag casting method utilizing dental or die stone — A one-gallon size plastic Ziploc® bag is ideal for the storing, mixing, and casting process. Approximately 12 ounces of water should be mixed with two pounds of dental or die stone. A 12-ounce beverage container can

be sufficient to make a cast of a footwear impression. The water can be added to the pre-measured casting material in the plastic bag and mixed in the bag. The casting material should be the consistency of pancake batter. Pour the casting solution slowly, so it gently flows into the side of the impression instead of directly onto the impression. When the dental or die stone is “set,” place your initials, date, case information, etc., into the backside of the cast. Dental and die stone casts generally become “set” in approximately one hour. Do not remove any dirt, mud, debris, etc., which has adhered to the cast. (Additional casting material will be needed for larger impressions, such as tire tread impressions.)

Each cast should be securely packaged and properly sealed in an appropriate container(s) using shredded paper, packing peanuts, tissue, etc.

■ Toolmark Evidence

Tools

Do not remove trace evidence such as paint transfers, insulation, wood particles, debris, etc., which has adhered to the tool. The “working areas” of a suspect tool should be preserved in some manner to prevent loss of trace evidence and to protect its working parts.

Toolmark Impressions

Do not insert a suspect tool into a toolmark. Items such as wires, chain links, pipe, etc., which have questioned toolmarks should be submitted. The areas cut or removed by the submitting agency should be distinguished from the questioned areas using tags, labels, taping, bending, inking, etc.

Casting of Toolmarks

MIKROSIL™ or forensic silicone type materials are recommended for the casting of questioned toolmarks on items that cannot be submitted. Each tool, item, or cast should be packaged securely and properly sealed in an appropriate container.

4. Latent Prints

Generally, latent prints on nonporous materials deteriorate rapidly upon prolonged exposure to high temperature and humidity. Consequently, items should be processed and/or forwarded to a laboratory as soon as possible. Gloves should be worn when handling all items to be submitted for latent print processing. With the assistance of the Missouri State Highway Patrol Automated Fingerprint Identification System (AFIS), the entire tenprint and/or palmprint database may be searched. When no candidate is generated through an AFIS search, the latent print(s) will be searched through the FBI’s Next Generation Identifica-

tion (NGI) database. Additional searches through the Kansas Bureau of Investigation AFIS database may be performed, if previous MSHP and NGI searches are negative.

■ Exemplar (Known) Prints

Collect tenprints and palmprints of suspect(s), other persons under investigation, and any other person who may have touched the object bearing latent print(s) including victims and/or those processing the scene ungloved. The role (suspect, victim, or elimination) or source should be noted on the card and/or agency paperwork. When LiveScan prints are submitted electronically, a state identification number should be provided for each subject upon submission. Container(s) should be sealed and properly labeled. If exemplar prints are unable to be collected, subject name(s), date of birth, and social security number should be provided to allow for a search for exemplars to be conducted.

■ Photographing Latent Prints

A scale showing a minimum of 10mm or 1 inch should be visible in the image when photographing latent prints. A tripod or camera stand should be used, and the camera lens should be parallel to the surface bearing the latent print(s). An independent light source (high-powered flashlight or similar) should be used in lieu of camera flash. Photographs must be captured in RAW format for submission to the laboratory. All images should be saved on a disc or USB drive for submission. Printed images are not suitable for examinations. Container(s) should be sealed and properly labeled and all comparison exemplar(s) should be collected.

■ Latent Prints — Porous Surfaces

Place the paper, cardboard, or other porous surfaces in a plastic bag or cellophane protector. Do NOT attempt to develop latent prints on porous/absorbent surfaces yourself. Any questioned document examinations must be completed on items prior to submission to laboratory, as this type of evidence may be destroyed during latent print processing. Container(s) should be sealed and properly labeled, and all comparison exemplar(s) should be collected.

■ Latent Prints — Nonporous Surfaces

Conventional and/or magnetic powder may be used to process plastic, metal, glass, and/or other nonporous surfaces for latent prints. Developed prints may be collected with lifting tape and placed on a

lift card, and/or collected using hinge or gel lifters. The use of black or bichromatic powder and white cards/lifters is recommended. Mark the card/lift with a description of the surface from which the print was lifted. Please do NOT circle, draw arrows, or further indicate location of latent prints. Nonporous items may also be submitted to the laboratory for processing. Photographs may be taken in addition to and/or in lieu of lifts or item submission. (See Photographing Latent Prints.) Container(s) should be sealed and properly labeled, and all comparison exemplar(s) should be collected.

■ Latent Prints — Soft Surfaces

Carefully remove putty, caulking compound, or other soft material bearing visible latent print impressions. Leave as much excess material surrounding the latent print as possible. Carefully adhere the mass of material to a stiff section of cardboard. Tape a protective cover over the specimen. A paper cup or baby food jar is useful for this purpose. Do not touch or otherwise distort the latent print. Photographs may be taken in addition to and/or in lieu of collection. (See Photographing Latent Prints.) Container(s) should be sealed and properly labeled, and all comparison exemplar(s) should be collected.

■ Latent Prints — Wet Surfaces

When latent print evidence found in a body of water is collected it should remain in the original water. A watertight container should be lowered into the water and allowed to fill. This allows the evidence to be placed in the container without exposing it to the air. If latent print evidence found in water is allowed to dry before processing, the likelihood of developing prints of value dramatically decreases. Container(s) should be sealed and properly labeled, and all comparison exemplar(s) should be collected.

■ Latent Prints — Dust

Latent prints in dust are extremely fragile and not conducive to lifting methods. Attempting to lift a latent print may destroy the impression. When latent prints are located in dust, the best collection method is photography. (See Photographing Latent Prints.) Containers should be sealed and properly labeled, and all comparison exemplar(s) should be collected.

■ Packaging Latent Print Evidence

Use ingenuity to construct special containers to protect nonporous surfaces. Never place material directly on the evidence surface that potentially bears latent prints. Ensure that two surfaces bearing latent prints do not come into contact during packaging or when being transported to the laboratory. Paper or cardboard may be used to protect the latent print surface. Orient and secure the cardboard so it does not come into direct contact with the potential print bearing surface. Nonporous items should then be packaged in paper and/or cardboard to preserve possible latent prints on the items. Latent prints on porous/absorbent surfaces are incorporated into the surface of the material; therefore, loss of these prints through friction and surface contacts is of lesser concern. More than one porous item (e.g. paper, cardboard, etc.) may be placed in a container for submission to the laboratory. Care should be taken to appropriately package adhesive items (e.g. tape) to prevent adhesion of the item to the container and/or itself. The Latent Print Section no longer routinely accepts cigarette butts, rolled cigarettes, or syringes for latent print processing. If in doubt about how to package latent print evidence, please contact laboratory.

■ Postmortem Identification Submission

Impressions for postmortem identification examinations may be submitted either via laboratory evidence submission policies or the on-line Postmortem Identification Request Submission form (<https://www.mshp.dps.missouri.gov/CL01Web/newRequest.htm>). Those submitted online must have a resolution of 500 ppi or higher, be submitted in TIF format, and include a scale. The nearest Latent Print Section should be notified of the request as soon as possible to allow for proper preparation. If a possible identity is known, any information (name, date of birth, social security number, state identification number, FBI number) should be provided.

■ Identification

There is no set size requirement of a latent print for identification, and there is no specific number of characteristics required to effect an identification. As a general rule, if the investigator develops an area which appears to have several ridges, regardless of the size of the area, it should be lifted, properly labeled, packaged, and submitted to the laboratory.

5. Toxicology

All body fluids are biohazardous. Assume all specimens are infectious. Wear latex gloves when handling blood or urine specimens. Package samples in a way that will contain any leakage. Wash your hands thoroughly after handling any blood or urine specimen. Do not store blood or urine specimens in a place where you store food or drink.

■ Blood Alcohol Determinations

Whole blood is the best body fluid for alcohol testing. Serum, plasma, and vitreous humor are acceptable specimens, but only if they contain the proper preservatives. Urine is not a reliable specimen for accurately determining a blood alcohol level. Urine will not be analyzed for alcohol.

Blood and blood products must be collected in a sterile, gray stopper blood collection tube which contains the additives sodium fluoride (NaF) and potassium oxalate (K₂Ox). Samples which do not contain sodium fluoride will not be analyzed for alcohol. If your sample is also needed as a reference standard for DNA, collect a separate, duplicate sample in a purple stopper blood collection tube.

The site of blood collection on the suspect's arm must be cleansed with a nonalcoholic antiseptic. The most common nonalcoholic antiseptic is povidone-iodine (Betadine). Sterile water and ordinary tap water are not antiseptics and do not fulfill the requirements of the law. Be aware that some antiseptics contain both alcohol and povidone-iodine and are labeled as such. Do not use antiseptics containing any form of alcohol. The package from the antiseptic swab or pad must be preserved to prove in court that a nonalcoholic antiseptic was used. Do not preserve the swab or pad itself.

The blood specimen must be drawn using a new, sterile needle. The package from the needle must be preserved to prove in court the legal collection requirements were followed. Do not preserve the needle itself. Discard the needle in a proper sharps container.

After the blood is collected, mix the blood and the additives in the tube by gently inverting the tube at least 15-20 times. This will prevent the blood from clotting. Mark the tube with the person's name, your initials, and your case number, if available. Do not apply evidence tape to the blood collection tube. One tube of blood (10 milliliters) is sufficient for alcohol testing.

Do not collect multiple specimens at different times in an attempt to demonstrate what the suspect's blood alcohol level may have been earlier. This process is likely to complicate the case and will not increase the ability of the toxicologist to "back calculate" the suspect's blood alcohol

level. Routinely, only the blood specimen collected nearest the time of incident will be tested.

Do not submit blood specimens for blood alcohol testing if a valid evidentiary breath test has already been performed.

It is advisable to store the blood tube(s) under refrigeration until submission to the laboratory. Do not freeze the blood sample because the tube may break. Protect the blood from extreme heat, such as a hot car during the summer. If properly packaged, blood specimens may be sent to the laboratory through U.S. Mail.

■ Toluene/Solvent Abuse/Glue Sniffing

Collect a blood sample as described above.

■ Drug Testing

Drug tests on their own will not establish impairment at the time of arrest. The officer's observations relating to the suspect's degree of impairment will be critical to prosecuting a drug impairment case.

Blood must be collected as described in "Blood Alcohol Determinations." Collect two tubes of blood (20 milliliters for drug testing). Whole blood is the preferred sample to collect for driving while intoxicated type cases.

Urine must be collected in a clean, dry, leakproof, plastic container. Urine collection must be observed to prevent the suspect from adulterating the sample. An observer of the same gender as the person should accompany the person into the restroom stall and actually observe the urine flowing into the cup. At least 50 milliliters of urine should be collected. If the suspect cannot provide sufficient urine, have the suspect drink a glass of water, wait 15 minutes, then try again. Once the urine is collected, mark the container with the suspect's name, your initials, and your case number, if available. Seal the container with evidence tape and initial the seal as well. The specimen container should then be double-bagged in leakproof, zippered, plastic bags. The double-bagged specimen may be placed in a plastic bag or box. Always seal and initial the outermost container. Urine will not be routinely tested for driving while intoxicated type cases unless special circumstances exist.

If the urine sample cannot be delivered to the laboratory within 24 hours of collection, the urine must be refrigerated. This is a legal requirement. For long term storage (more than a day), the urine sample should be frozen. Do not send urine samples through the U.S. Mail.

Please indicate on the Web LAR or the LAR form which drugs you think the person might have ingested.

■ Suspected Poisoning

Collect blood and urine as described above. Stomach contents can be useful in investigating poisonings. If stomach contents are available, package and store them as you would a urine sample. Please consult the laboratory before submitting evidence from a suspected poisoning case.

6. Trace Evidence

Many trace evidence examinations require the comparison of collected crime scene samples (questioned samples) to standard samples of known origin to determine if the questioned sample may have originated from a particular source. For example, paint samples in a hit-and-run scenario should be collected from both a victim's clothing and a suspect's vehicle. Trace evidence comparison may show the two samples collected may have originated from the same source, i.e. the suspect's vehicle.

If standards of known origin (hair, fiber, paint, glass, etc.) are collected as they are encountered, much time can be saved from tracking down standards later.

■ Ignitable Liquids

When fire debris is collected for the identification of an "accelerant," the important concern is the type of container used for the preservation of the debris. Several containers are acceptable: glass jars, metal cans (epoxy-coated is preferred), nylon bags, or polyester Kapak-style bags. Unacceptable containers include paper bags, cardboard boxes, and ordinary plastic bags. The use of an unacceptable container exposes the sample to possible contamination. The laboratory will analyze only properly packaged fire debris evidence.

Arson evidence should be submitted to the laboratory as soon as possible. Otherwise, the evidence should be stored in a freezer (ideally) until it can be submitted.

■ Explosives

Intact explosives: Any explosive device must be rendered safe before submission to the laboratory. It is preferable to disrupt a device rather than introducing another explosive by counter-charging. Once rendered safe, the explosive material can then be safely packaged into antistatic bags, small screw top glass vials, or metal cans. Only two or three grams of the suspected explosive material need be submitted. The submitted samples will be analyzed to identify any explosive ingredients if present.

Three inches of safety fuse is generally adequate for analysis.

Pyrotechnic devices and M-80 type devices may be placed in boxes and may be submitted intact to the laboratory.

Submit only small amounts of high explosives (one inch from a stick of dynamite, or one ounce of C-4, gels, or emulsions) in wide mouth jars with Teflon-lined lids. Submit the explosives manufacturers' wrappers and labels.

Do not submit detonators. Laboratory examinations are not performed on detonators.

Post-blast: Collect and submit any remains of the explosive device. If a crater is present in soil, asphalt, or concrete, any loose debris can be collected and placed in paint cans for laboratory analysis of remaining explosive material. If the blast occurs in a vehicle or residence, seat cushions, carpeting, or flooring from the blast site can be collected and packaged in paper bags for analysis.

■ Fiber

Fiber transfer evidence can be significant in establishing a link between clothing and an object that came into forcible contact with the clothing, as in "hit and run" cases, assaults, or homicides that involve blunt trauma. Carpet and blanket fibers can be easily shed and attach to items on contact. Such fibers can be useful in associating an object to a residence or vehicle. Ropes can be compared, also.

Fiber collection techniques at the scene include tape lifting, vacuuming, or hand collection of individual fibers.

■ Filaments

An ON or OFF condition of a vehicle lamp at the time of a crash frequently can be determined by examining the filaments of that lamp. When submitting vehicle lamps for filament examinations, submit the entire lamp housing, if possible. That way, the original orientation of the lamp is preserved. Broken lamps often provide excellent evidence of an ON or OFF condition. Take care to retain the pieces of the lamp. Broken lamps with exposed filaments should be considered fragile and packaged in boxes or plastic containers and secured with tape or packaged with paper toweling to reduce movement so further damage does not occur during subsequent handling.

■ Glass

Where the crime scene involves broken glass, the suspect's clothing and shoes may contain glass fragments. Fragment sizes not readily vis-

ible to the unaided eye may still be usable for glass comparison analysis. Please handle and package evidence carefully to prevent loss of small fragments. The laboratory recommends the investigator carefully search clothing items and shoes for glass fragments. Clothing and shoes may be packaged in paper bags.

Collect and submit a known glass standard from the broken window, mirror, lamp or bottle. Standard glass samples can be placed in metal canisters, plastic vials, or in appropriately sealed boxes.

■ Gunshot Residue

The Gunshot Residue Kit: The Missouri State Highway Patrol Crime Laboratory currently supplies the SEM/EDX Gunshot Residue Kit to law enforcement agencies. The kit contains two carbon tape lift collection stubs (one for each hand), a pair of gloves, and an instruction/data sheet. It is important to complete the data sheet. When possible, administer the gunshot residue kit where the subject is apprehended and prior to transporting the subject, and especially before any other actions are taken that involve processing of the hands (e.g. fingerprinting). Gunshot residue rapidly decreases in concentration through normal activity within about two hours and is readily removed by washing of the hands.

During collection of the kit, avoid blood on the hands. Blood defeats the adhesive of the collection stub. Sample around any blood on hands.

Kits should be collected from living subjects within six hours of an incident. Routinely, kits collected after more than eight hours will not be analyzed. Routinely, kits collected from shooting victims, whether suicide or homicide, will not be analyzed.

■ Hair

Hair can be transferred readily from one person to another, especially in a physical altercation. Hair also is shed randomly from the body as a natural process. Hair is a biological specimen of the body and may be associated back to its source through DNA analysis (although DNA is not always successfully extracted from hair). On items that are too large for submission, such as car seats or furniture, hair collection techniques include tape lifting, vacuuming, or individual collection of single hairs may be utilized. Collected hairs may be placed on a Post-it note to prevent loss.

For microscopic comparison purposes, proper hair standards should be collected from all the individuals involved. A proper standard consists of 50 randomly pulled head hairs representing the entire scalp and 25 randomly pulled pubic hairs. Hairs will be examined for eligibility for DNA analysis.

■ Paint

Paint transfer, whether vehicular or architectural, provides good associative evidence. Collect paint transfers using razor blades or sharp knives. It may be easiest to collect the underlying paint with the transfer adhered to its surface. Standard paint samples should be collected from all vehicles involved and from areas close to the impact area. Clearly label evidence as standard or transfer samples and indicate from which vehicle they came. Submit painted tools or other implements for comparison to collected paint transfers from homes or businesses.

Collect paint scrapings of standards or transfers in paper folds, metal canisters, or pill boxes. Avoid plastic bags. Seal containers with tape to ensure paint samples cannot escape packaging.

■ Soil

Soil comparisons can help place a suspect or suspect vehicle at a particular location. Soil present on a suspect's clothing, shoes, shovel, or vehicle can be compared in the laboratory to standard soil samples collected from the crime scene such as a grave site, field, or yard. Items such as clothing or shoes with soil transfers on them can be submitted for laboratory examination by placing them in bags or boxes.

Collect soil standards for comparison to unknown/questioned soils. Collect soil standards from the surface, except for graves, where samples from below the surface will also need to be collected. Collect soil standards from three to six locations in the immediate area (three to 10 feet) of interest. This will provide the trace examiner with known soil variations within the crime scene. The equivalent of about one-half to one cup is sufficient. The samples should be packaged in separate containers or metal cans. If samples are wet, allow them to dry prior to sealing.

■ Tape

Duct tape, packaging tape, and black electrical tape are sometimes used in the preparation of improvised explosive devices or to bind victims of sexual assault and homicide. Tapes collected from devices or victims can be compared to rolls of tape collected from the vehicle or residence of a suspect. Questioned and known tape samples should be packaged in separate paper or plastic bags.

7. CODIS Section

The Combined DNA Index System (CODIS) database is used to support law enforcement by providing investigative leads to cases. The database relies upon properly collected offender DNA samples.

The FBI Laboratory's Combined DNA Index System blends forensic science and computer technology into an effective tool for solving crimes. CODIS enables federal, state, and local crime laboratories to exchange and compare DNA profiles electronically, thereby linking crimes to each other and to offenders.

The Missouri State Highway Patrol is designated by Section 650.052 RSMo. to be the Central Repository for the DNA profiling (CODIS) system. This includes the management of the Offender DNA Profiling program in Missouri, as well as collaborating with the FBI and other Missouri CODIS laboratories. Pursuant to Section 650.055 RSMo., the CODIS Section generates profiles from offenders, to include those arrested for or convicted of certain offenses, sex offender registrants, and violent sexual predators. Those DNA profiles are then entered into the CODIS database.

Offender samples are collected by law enforcement, corrections, and MSHP laboratory personnel. All collections must be performed using the Missouri Offender DNA Collection Kit, which is provided by the Patrol Crime laboratory. The kits and DNA samples pose a chemical and biological hazard and must be handled wearing gloves. The offender samples are used for investigative purposes and are not considered evidence.



Section IV

Glossary

Glossary

- Anticoagulant** — A chemical substance which retards the clotting of blood.
- Catalyst** — A substance that initiates a chemical reaction. **WARNING:** Catalysts may be highly reactive and may react violently with water, air, or solvents. Examples: lithium strips (water reactive), sodium metal (water reactive), Raney nickel (air and solvent reactive).
- Clandestine Laboratory** — An illicit operation consisting of a sufficient combination of apparatus and chemicals that either has been or could be used in the manufacture or synthesis of controlled substances.
- Common Origin** — Natural or manufactured materials, such as soil or fibers, originating from the same source.
- Coroner** — An official responsible for an inquiry into the causes and circumstances of any violent, unexpected, or suspicious death occurring within his jurisdiction.
- Gas Chromatography** — A method for the separation of complex mixtures into their individual components. As vapor of the mixture is passed through a column, the individual components dissolve to varying extents in a liquid within the column, and a separation is affected. The separated components provide an indication of the identity of the original mixture.
- Gunshot Residue** — Material from the primer deposited on the hands of a shooter or a shooting victim during a firearm discharge. Lead, Barium, and Antimony from the primer mixture are the principal gunshot residue components.
- Ignitable Liquid** — A combustible or flammable liquid that will ignite easily and sustain a fire; might be used criminally to increase the rate and intensity of an intentionally set fire.
- LMG (Leucomalachite Green) Test** — A screening test for blood.
- Mass Spectrometry** — A method by which a chemical compound is identified by ionization and measurement of the mass/charge ratios of the charged and fragmented molecules produced by the breakdown of the molecule by this ionization.

- Medical Examiner** — A physician, usually a pathologist, authorized by statute to perform medical legal investigations in violent or suspicious deaths.
- Precursor Chemical** — A primary chemical that is chemically changed into the finished controlled substance product, usually in connection with a clandestine laboratory. Examples: ephedrine, pseudoephedrine, phenyl-2-propanone.
- Reagent Chemical** — Chemicals used in reactions to convert the precursor into the finished product. Examples: hydrochloric acid, iodine crystals, anhydrous ammonia, red phosphorus.
- Solvents** — Chemicals used to separate, purify, or dissolve other chemicals in a chemical reaction. Examples: white gas (naphtha, camp fuel), Freon, alcohol, ether.
- Standard** — Material of a known origin or composition used as a reference or as a basis for comparison. May be referred to as a “control” or “known.”
- STR (short tandem repeat)** — Areas of the DNA molecule that can be typed for comparisons between crime scene samples and comparison standards.

